

REMARKS

The Office Action mailed December 19, 2002, has been received and reviewed. Claims 3 through 27 are currently pending in the application. Claims 1 through 15 stand rejected.

Claims 1, 2, 5, 6, and 9 through 11 have been cancelled. Applicant has amended claims 3, 4, 7, 8, 12, 13, and 14 and has added claims 16 through 27 and respectfully requests reconsideration of the application as amended herein.

Preliminary Amendment

Applicant's undersigned attorney notes the filing herein of a Preliminary Amendment on January 25, 2002, which filing was not acknowledged in the outstanding Office Action. Should the Preliminary Amendment have failed for some reason to have been entered in the Office file, Applicant's undersigned attorney will be happy to have a true copy thereof hand-delivered to the Examiner.

35 U.S.C. § 102(b) Anticipation Rejections

Anticipation Rejection Based on Japanese Patent No. JP 6151492 to Sony Corp.

Claims 1, 2, 5, 6, 9 through 11, and 15 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Japanese Patent No. JP 6151492 to Sony Corp. ("492"). Claims 1, 2, 5, 6, and 9 through 11 have been cancelled, thus rendering the rejection moot. Applicant respectfully traverses the rejection to Claim 15, as presently amended, as hereinafter set forth.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Claim 15, as presently amended, depends from independent Claim 12. Independent Claim 12 includes multiple encapsulant restraining cavities wherein at least one of said multiple cavities includes recesses formed in said inside surface on said at least one of said first member and said

second member, said recesses sized and configured to at least partially receive conductive structures protruding from the substrate. Thus, the '492 reference does not disclose each and every element of Claim 12. Accordingly, Applicant respectfully requests reconsideration and allowance of Claim 12.

Anticipation Rejection Based on Japanese Patent No. JP 9162210 to Nippondenso Co. Ltd.

Claims 1, 2, 5, and 6 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Japanese Patent No. JP 9162210 to Nippondenso Co. Ltd. Claims 1, 2, 5, and 6 have been cancelled, thus rendering the rejection moot.

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on Japanese Patent No. JP 6151492 to Sony Corp. Taken Together With Japanese Patent No. JP 11097470 to Rohm Co. Ltd.

Claims 3, 4, 7, 8, and 12 through 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Japanese Patent No. JP 6151492 to Sony Corp. ("492") taken together with Japanese Patent No. JP 11097470 to Rohm Co. Ltd. ("492"). Applicant respectfully traverses this rejection, as hereinafter set forth.

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, **the prior art reference (or references when combined) must teach or suggest all the claim limitations.** The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vueck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (Emphasis added).

The 35 U.S.C. § 103(a) obviousness rejections of claims 3, 4, 7, 8, and 12 through 14 are improper because there is no motivation to combine the references and the references, taken alone or in combination, fail to teach or suggest all the claim limitations.

The '492 reference teaches that an encapsulant mold may be oriented vertically. However, the reference appears to be silent regarding recesses that support the balls of a BGA assembly.

The '470 reference teaches that a positioning fixture (2) that contains recesses may be used in combination with a mold member. However, as may be seen particularly in FIG. 4 of the '470 reference, the positioning fixture (2) does not actually contact any encapsulant. Rather, the positioning fixture (2) appears to support the mold member (1) so that sufficient force may be applied to seal the encapsulant within the cavity (6).

It further appears that neither the '470 reference nor the '492 reference teach or suggest a mold member with features that may be disposed against contact pads of a substrate.

As to the combination of the '470 reference with the '492 reference, there is no motivation to combine the references with one another because each reference teaches away from the other.

First, the '470 reference includes embodiments which may not function in a vertical alignment. Specifically, the embodiment as shown in FIG. 2 does not appear suitable for resisting the force of gravity in a vertical orientation because the grooves will allow the substrate to move vertically. Even the embodiment as shown in FIG. 1, wherein cavities are formed to accept the solder balls of the BGA would likely be unsuitable to resist the force of gravity because the clearance between the balls and the cavities would likely prevent any mechanical constraint of the BGA thereby. Of course, the pins 12 as taught by the '492 reference would resist the force of gravity, but would be superfluous when combined with the invention as taught by the '470 reference because such fixturing was apparently not required by the '470 reference, as it was not included therein.

Moreover, the configuration of the encapsulation system as shown in the '470 reference is not compatible with the encapsulation system as shown in the '492 reference. The '470 reference teaches encapsulation of the surface that the semiconductor chip is mounted upon. In contrast,

the '492 reference teaches encapsulation of both sides of the substrate. Encapsulation of both sides of the substrate as taught by the '492 reference would seal the solder balls of the '470 reference within the encapsulant, rendering the BGA assembly as taught by the '470 reference unsuitable for its intended purpose because the solder balls must be electrically accessible for operation of the semiconductor device.

Moving to Claim 3, independent Claim 3, as presently amended, recites the presence of at least one encapsulant restraining cavity having at least one surface with recesses formed therein, said recesses configured to at least partially receive conductive structures protruding from a substrate. Neither the '470 reference nor the '492 reference, taken alone or in combination, teach or suggest an encapsulant restraining cavity having recesses configured to at least partially receive conductive structures protruding from a substrate. At most, the '470 reference teaches that a positioning fixture may have recesses but does not teach or suggest that an encapsulant restraining cavity may have recesses. Therefore, Applicant respectfully requests reconsideration and allowance of independent Claim 3.

Independent Claim 4, as presently amended, recites the presence of at least one encapsulant restraining cavity having at least one surface with protrusions sized and configured to be disposed against contact pads of a substrate positionable in said at least one cavity. Neither the '470 reference nor the '492 reference teach protrusions sized and configured to be disposed against the contact pads of a substrate. Accordingly, Applicant respectfully requests reconsideration and allowance of independent Claim 4.

Independent Claim 7, as presently amended, recites the presence of at least one encapsulant restraining cavity having at least one surface with recesses including portions configured to receive conductive structures protruding from a substrate. The references, taken alone or in combination, fail to teach or suggest all of the claim limitations. Applicant respectfully requests reconsideration and allowance of independent Claim 7.

Similarly, independent Claim 12, as presently amended, recites the presence of multiple encapsulant restraining cavities wherein at least one of said multiple cavities includes recesses formed in said inside surface on said at least one of said first member and said second member.

said recesses sized and configured to at least partially receive conductive structures protruding from the substrate. Applicant respectfully requests reconsideration and allowance of independent Claim 12.

Independent Claim 8, as presently amended, recites the presence of at least one encapsulant restraining cavity having at least one surface with protrusions sized and configured to engage portions of contact pads of a substrate. The references, taken alone or in combination, do not teach or suggest protrusions sized and configured to be disposed against the contact pads of a substrate. Applicant respectfully requests reconsideration and allowance of independent Claim 8.

Similarly, independent Claim 13, as presently amended, recites the presence of multiple encapsulant restraining cavities wherein at least one of said multiple cavities includes protrusions formed on said inside surface of at least one of said first member and said second member, said protrusions sized and configured to be disposed against contact pads of the substrate. Applicant respectfully requests reconsideration and allowance of independent Claim 13.

Moreover, independent Claim 14, as presently amended, recites the presence of multiple encapsulant restraining cavities wherein at least one of said multiple cavities includes protrusions sized and configured on said inside surface of said at least one of said first member and said second member for engaging portions of contact pads on the substrate. Neither the '470 reference nor the '492 reference teach engaging portions of contact pads on a substrate. Therefore, Applicant respectfully requests reconsideration and allowance of Claim 14.

Obviousness Rejection Based on Japanese Patent No. JP 9162210 to Nippondenso Co. Ltd.

Taken Together With Japanese Patent No. JP 11097470 to Rohm Co. Ltd.

Claims 3 and 4 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Japanese Patent No. JP 9162210 to Nippondenso Co. Ltd. ("210") reference taken together with Japanese Patent No. JP 11097470 to Rohm Co. Ltd ("470"). Applicant respectfully traverses this rejection, as hereinafter set forth.

The teachings of the '470 reference are discussed hereinabove.

The '210 reference teaches that a resin may be poured into a mold cavity and thus form a flat surface suitable for vacuum chuck manipulation with a greatly reduced cost of the mold. More specifically, the invention teaches that a single mold member may be fabricated from plastic and that the resin may be introduced at relatively low pressure. (Paragraph 13 and 32 of translation).

Applicant notes that the Office Action states that the rejection is based upon reference '210 in combination with reference '470. However, reference '492 is mentioned in the rejection as well. (Page 3, last paragraph). Applicant requests clarification as to the rejection if it includes any dependence upon reference '492.

As to the combination of reference '210 and reference '470, there is no motivation to make such a combination.

As discussed hereinabove, '470 reference teaches an embodiment as shown in FIG. 2 that may not be suitable for resisting the force of gravity in a vertical orientation because the grooves will allow the substrate to move vertically. Similarly, the embodiment as shown in FIG. 1, would likely be unsuitable to resist the force of gravity because the clearance between the balls and the cavities would likely prevent any mechanical constraint of the BGA thereby. Furthermore, in this case, reference '210 teaches away from such a combination because it expressly teaches away from two machined mold fixtures.

As discussed hereinabove, independent Claim 3, as presently amended, recites the presence of at least one encapsulant restraining cavity having at least one surface with recesses formed therein, said recesses configured to at least partially receive conductive structures protruding from a substrate. Neither the '470 reference nor the '210 reference taken alone or in combination teach or suggest an encapsulant restraining cavity having recesses configured to at least partially receive conductive structures protruding from a substrate. The '470 reference does not teach or suggest that an encapsulant restraining cavity may have recesses. Accordingly, Applicant respectfully requests reconsideration and allowance of independent Claim 3.

Independent Claim 4, as presently amended, recites the presence of at least one encapsulant restraining cavity having at least one surface with protrusions sized and configured

to be disposed against contact pads of a substrate positionable in said at least one cavity. Neither the '470 reference nor the '210 reference teach protrusions sized and configured to be disposed against the contact pads of a substrate. Applicant respectfully requests reconsideration and allowance of independent Claim 4.

New Claims

New claims 16 through 25 correspond, respectively, to cancelled claim 2 (new claims 16 and 17 depend, respectively, from claims 3 and 4), to cancelled claim 6 (new claims 18 and 19 depending, respectively, from claims 7 and 8), to cancelled claims 10 and 11 (new claims 20 and 21 depending from claim 12, new claims 22 and 23 depending from claim 13 and new claims 24 and 25 depending from claim 14). New claims 26 and 27 correspond to claim 15 and depend, respectively, from claims 13 and 14.

Drawings

Applicant submits herewith formal drawings, under cover of a separate Transmittal of Formal Drawings. Applicant respectfully requests approval of the formal drawings.

ENTRY OF AMENDMENTS

The amendments to claims 3, 4, 7, 8, 12, 13, and 14 above should be entered by the Examiner because the amendments are supported by the as-filed specification and drawings.

CONCLUSION

Claims 3, 4, 7, 8, 12, 13, 14 and 16 through 27 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicant's undersigned attorney.

Respectfully submitted,

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Enclosure: Version With Markings to Show Changes Made

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

3. (Amended) A transfer molding apparatus comprising:
first and second members configured to be assembled with one another;
at least one encapsulant restraining cavity formed in at least one of said first and second
members, said at least one cavity extending longitudinally in a non-horizontal orientation;
at least one gate at a lower portion of said at least one cavity;
at least one vent at an upper portion of said at least one cavity; and

[The apparatus according to claim 1,] wherein said at least one cavity includes at least one surface with recesses formed therein, said recesses configured to at least partially receive conductive structures protruding from a substrate positionable in said at least one cavity.

4. (Amended) A transfer molding apparatus comprising:
first and second members configured to be assembled with one another;
at least one encapsulant restraining cavity formed in at least one of said first and second
members, said at least one cavity extending longitudinally in a non-horizontal orientation;
at least one gate at a lower portion of said at least one cavity;
at least one vent at an upper portion of said at least one cavity; and

[The apparatus according to claim 1,] wherein said at least one cavity includes at least one surface with protrusions sized and configured to be disposed against contact pads of a substrate positionable in said at least one cavity.

7. (Amended) A transfer molding apparatus comprising:
first and second members to be assembled with one another;
at least one encapsulant restraining cavity formed in at least one of said first and second
members, said at least one cavity extending longitudinally in a substantially vertical
orientation;
at least one gate at a lower portion of said at least one cavity;
at least one vent at an upper portion of said at least one cavity; and

[The apparatus according to claim 5,] wherein said at least one cavity includes at least one surface with recesses formed therein, said recesses including portions configured to receive conductive structures protruding from a substrate positionable in said at least one cavity.

8. (Amended) A transfer molding apparatus comprising:
first and second members to be assembled with one another;
at least one encapsulant restraining cavity formed in at least one of said first and second
members, said at least one cavity extending longitudinally in a substantially vertical
orientation;
at least one gate at a lower portion of said at least one cavity;
at least one vent at an upper portion of said at least one cavity; and

[The apparatus according to claim 5,] wherein said at least one cavity includes at least one surface with protrusions sized and configured to engage portions of contact pads of a substrate positionable in said at least one cavity.

12. (Amended) A transfer molding apparatus for molding a substrate in a
substantially vertical orientation, the apparatus comprising:
a first member and a second member configured to be assembled with one another, each of said
first member and said second member having an inside surface and an outside surface;
multiple encapsulant restraining cavities each formed in said inside surface of at least one of said
first member and said second member, each of said multiple cavities sized and configured
for the substrate to be disposed therein, said multiple cavities extending longitudinally in
a non-horizontal orientation;
at least one gate formed in any one of said first member and said second member extending from
a lower portion of each of said multiple cavities; and

at least one vent formed in any one of said first member and said second member extending from
an upper portion of each of said multiple cavities; and

[The transfer molding apparatus of claim 9,] wherein at least one of said multiple cavities includes recesses formed in said inside surface on said at least one of said first member and said

second member, said recesses sized and configured to at least partially receive conductive structures protruding from the substrate positionable in said at least one of said multiple cavities.

13. (Amended) A transfer molding apparatus for molding a substrate in a substantially vertical orientation, the apparatus comprising:
a first member and a second member configured to be assembled with one another, each said first member and said second member having an inside surface and an outside surface;
multiple encapsulant restraining cavities each formed in said inside surface of at least one of said first member and said second member, each of said multiple cavities sized and configured for the substrate to be disposed therein, said multiple cavities extending longitudinally in a non-horizontal orientation;
at least one gate formed in any one of said first member and said second member extending from a lower portion of each of said multiple cavities; and
at least one vent formed in any one of said first member and said second member extending from an upper portion of each of said multiple cavities; and
[The transfer molding apparatus of claim 9,] wherein at least one of said multiple cavities includes protrusions formed on said inside surface of at least one of said first member and said second member, said protrusions sized and configured to be disposed against contact pads of the substrate positionable in said at least one of said multiple cavities.

14. (Amended) A transfer molding apparatus for molding a substrate in a substantially vertical orientation, the apparatus comprising:
a first member and a second member configured to be assembled with one another, each said first member and said second member having an inside surface and an outside surface;
multiple encapsulant restraining cavities each formed in said inside surface of at least one of said first member and said second member, each of said multiple cavities sized and configured for the substrate to be disposed therein, said multiple cavities extending longitudinally in a non-horizontal orientation;

at least one gate formed in any one of said first member and said second member extending from
a lower portion of each of said multiple cavities; and

at least one vent formed in any one of said first member and said second member extending from
an upper portion of each of said multiple cavities; and

[The transfer molding apparatus of claim 9,] wherein at least one of said multiple cavities includes protrusions sized and configured on said inside surface of said at least one of said first member and said second member for engaging portions of contact pads on the substrate positionable in said at least one of said multiple cavities.

15. (Amended) The transfer molding apparatus of claim [9] 12, wherein said multiple cavities are configured and longitudinally oriented to provide a substantially vertical flow for encapsulation of the substrate positionable in said multiple cavities.